

1868. Flood.

1876. A planter kept count of the rain days and hours "as of old." The duration was 26 days and 187 hours. The corresponding rainfall was 215 mm.

1877. Rain began in February (0.38 inch on 9th at Valparaiso). Heavy rain in April; 3 inches in a heavy gale on 25th. May and June were mild, but very heavy rain in July caused floods on all the rivers of Central Chile.

Summing up, the author finds:

1. The climate of Chile is essentially stable.
2. Droughts have occurred at intervals from prehistoric times.
3. Periods of drought were much more prolonged formerly, especially in the eighteenth century, when they sometimes lasted 20 or 30 years, (1705-1723 and 1770-1797); and there were frequent years calamitous for public health and agriculture (1705, 1710, 1717, 1727, 1743, 1770, 1771, 1773, 1777, 1781, 1782, 1784, 1791, 1797, 1799). In the nineteenth century only two years were comparable with these (1832 and 1863).
4. Floods have occurred with a similar periodicity, but much further apart, and sometimes in the middle of a period of drought which they did not seriously modify. They were more frequent in the nineteenth century than in the eighteenth.
5. The rainy years occur almost always in groups, forming more or less long and homogeneous periods of three, five or more years.

To these conclusions I would add:

6. If we tabulate the data we find evidence of a remarkable double periodicity. Taking the wet periods first as being more sharply defined and completing the series from the readings of the rain gage at Santiago, we have:

	1536-1544	No records.
1609, 1618	1647	1692, 1697
1723	1744-1768	1779-1783
1827-1830	1850-1877	1898-1907

Between 1544 and 1609 there are no climatic data at all, but if we assume that this interval of 66 years was broken by a slight maximum of rainfall in the middle, we have from 1540 to 1904 the crests of 11 waves of rainfall, separated by 10 depressions, giving an average interval of 36 years, which agrees well with Brückner's period. The individual intervals were, in years:

(?) 37, (?) 37, 34, 48, 28, 33, 26, 48, 34, 40.

Further, the middle years of each century appear to have represented the maxima of a major wave of about 108 years (the intervals are 107, 109, 107 years), which agrees closely with periods of between 106 and 111 years advocated by various authors. There is evidence that this period goes back yet another cycle, in the statement referred to 1544; that a similar flood was experienced three generations earlier.

The chief periods of drought show a similar periodicity, but less marked:

	1637-1640	1650-1687
1705-1722	1743—	1770-1777
1784-1804	1831-1832	1879-1880
1909-1912		

RAINFALL VARIATIONS.

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At the meeting of the Royal Meteorological Society held on April 16, two papers on variations of rainfall were read.¹ The papers are summarized below.

Mr. A. A. Barnes, in his paper on "Rainfall in England, the true long-average as deduced from symmetry,"² stated that it has been usual to assume that the average annual rainfall during any period of 35 years can be adopted for obtaining the "long-average" at any rain gage, but he considers that the fluctuations which occur between such averages for various 35-year periods tend to show that the basis is somewhat uncertain. By an exhaustive analysis of the annual readings at 38 rain gages in England during the 62 years 1856-1917, he shows that variations of as much as 5 per cent. on each side of the mean are quite possible when dealing with successive 35-year periods. From these same records it is then shown that far greater consistency in the value of the average can be obtained by taking periods symmetrical about the end of the year 1886. Both by means of tables and diagrams Mr. Barnes shows that that date is a very critical one in regard to rainfall in England, and that, as a rule, the years before that date were relatively far wetter than years subsequent to it. Hence the balancing of the earlier wet years by the later dry years establishes the principle of symmetry about that date, and it is shown that by this method the maximum departure from normal which results from taking each of the fifteen long periods symmetrical to the end of the year 1886 does not exceed 1 per cent in the case of any of the 38 gages which were examined.

Mr. C. E. P. Brooks's paper was on "The secular variation of rainfall."³ In order to obtain a measure of the secular variation of rainfall during the past 30 to 50 years, correlation coefficients were worked out between the annual rainfall at each station and "time," the measure of the latter being the number of years before or after the middle year of the series. This was done for 162 stations distributed over the globe, and the results were charted on a map. This map shows that the greater part of the world is divided among a few definite regions of wide extent, in each of which the rainfall has been either increasing or decreasing. The most important area of increasing rainfall is temperate Eurasia (except the western seaboard); other areas are southeast South America and the south of Australia. Areas of decrease are the tropical regions as a whole, South Africa, and the west coast of Europe. It is noted that the number of sun-spots, and also that of solar prominences, during the period in question have been decreasing. For a few stations records of longer period are dealt with, giving indications that the results obtained are due to a periodicity of upwards of 50 years.

¹ See *Quart. Jour. Roy. Meteorological Soc.*, July, 1919, vol. 45, pp. 209-227, discussion, pp. 227-232. Abstract in *Sci. Abs.* Sept. 30, 1919, pp. 418-419.

² *Idem.*, pp. 209-232.

³ *Idem.*, pp. 233-248.